

## QSFP28-100GB-LR4-IN-AO

Intel® Compatible TAA 100GBase-LR4 QSFP28 Transceiver (SMF, 1295nm to 1309nm, 10km, LC, DOM)

### Features

- SFF-8665 Compliance
- Duplex LC Connector
- Commercial Temperature 0 to 70 Celsius
- Single-mode Fiber
- Hot Pluggable
- Excellent ESD Protection
- Metal with Lower EMI
- RoHS Compliant and Lead Free



### Applications

- 100GBase Ethernet
- Access and Enterprise

### Product Description

This Intel® QSFP28 transceiver provides 100GBase-LR4 throughput up to 10km over single-mode fiber (SMF) using a wavelength of 1295nm to 1309nm via an LC connector. It is guaranteed to be 100% compatible with the equivalent Intel® transceiver. This easy to install, hot swappable transceiver has been programmed, uniquely serialized and data-traffic and application tested to ensure that it will initialize and perform identically. Digital optical monitoring (DOM) support is also present to allow access to real-time operating parameters. This transceiver is Trade Agreements Act (TAA) compliant. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

AddOn's transceivers are RoHS compliant and lead-free.

TAA refers to the Trade Agreements Act (19 U.S.C. & 2501-2581), which is intended to foster fair and open international trade. TAA requires that the U.S. Government may acquire only "U.S. – made or designated country end products."



## Absolute Maximum Ratings

| Parameter                           | Symbol | Min. | Typ. | Max. | Unit |
|-------------------------------------|--------|------|------|------|------|
| Maximum Supply Voltage              | Vcc    | -0.5 |      | 3.6  | V    |
| Storage Temperature                 | TS     | -40  |      | 85   | °C   |
| Operating Case Temperature          | Tc     | 0    | 25   | 70   | °C   |
| Operating Humidity                  | RH     | 5    |      | 85   | %    |
| Receiver Damage Threshold, per Lane | Rxdmg  | 5.5  |      |      | dBm  |

## Electrical Characteristics

| Parameter                              | Symbol | Min.                     | Typ. | Max.  | Unit  | Notes   |
|--|--------|--------------------------|------|-------|-------|---------|
| Power Dissipation                      | PD     |                          |      | 3.5   | W     |         |
| Power Supply Voltage                   | Vcc    | 3.135                    | 3.3  | 3.465 | V     |         |
| <b>Transmitter</b>                     |        |                          |      |       |       |         |
| Differential data input swing per lane | Vin    |                          |      | 900   | Mvp-p |         |
| Input Impedance (Differential)         | Zin    |                          |      | 10    | %     |         |
| <b>Stressed Input Parameters</b>       |        |                          |      |       |       |         |
| Eye width                              |        | 0.46                     |      |       | UI    |         |
| Applied pk-pk sinusoidal jitter        |        | IEEE 802.3bm Table 88-13 |      |       |       |         |
| Eye height                             |        | 95                       |      |       | mv    |         |
| DC common mode voltage                 |        | -350                     |      | 2850  | mv    |         |
| <b>Receiver</b>                        |        |                          |      |       |       |         |
| Differential output amplitude          |        | 200                      |      | 900   | Mvp-p |         |
| Output Impedance (Differential)        | Zout   |                          |      | 10    | %     |         |
| Output Rise/Fall Time                  | tr/tf  | 12                       |      |       | ps    | 20%~80% |
| Eye width                              |        | 0.57                     |      |       | UI    |         |
| Eye height differential                |        | 228                      |      |       | mv    |         |
| Vertical eye closure                   |        |                          |      | 5.5   | db    |         |

## Optical Characteristics

| Parameter   | Symbol         | Min.                             | Typ.    | Max.    | Unit  | Notes |   |
|---|----------------|----------------------------------|---------|---------|-------|-------|---|
| <b>Transmitter</b>  |                |                                  |         |         |       |       |   |
| Signaling Speed per Lane                                  | Brave          |                                  | 25.78   |         | Gbps  |       |   |
| Data Rate Variation                                       |                | -100                             |         | +100    |       |       |   |
| Lane_0 Center Wavelength                                  | $\lambda_{C0}$ | 1294.53                          | 1295.56 | 1296.59 | nm    |       |   |
| Lane_1 Center Wavelength                                  | $\lambda_{C1}$ | 1299.02                          | 1300.05 | 1301.09 | nm    |       |   |
| Lane_2 Center Wavelength                                  | $\lambda_{C2}$ | 1303.54                          | 1304.58 | 1305.63 | nm    |       |   |
| Lane_3 Center Wavelength                                  | $\lambda_{C3}$ | 1308.09                          | 1309.14 | 1310.19 | nm    |       |   |
| Average Launch Power each Lane                            | $P_{each}$     | -4.3                             |         | 4.5     | dBm   | 1     |   |
| Optical Modulation Amplitude (OMA) each Lane              | $TxOMA$        | -1.3                             |         | 4.5     | dBm   |       |   |
| Difference in launch power between any two lanes (OMA)    |                |                                  |         | 5       | dB    |       |   |
| Launch power in OMA minus TDP, each lane                  |                | -2.3                             |         |         | dBm   |       |   |
| Transmitter and dispersion penalty (TDP), each lane       |                |                                  |         | 2.2     | dB    |       |   |
| Extinction Ratio  | ER             | 4                                |         |         | dB    |       |   |
| Side-mode Suppression ratio                               | SMSRmin        | 30                               |         |         | dB    |       |   |
| Average launch power of OFF transmitter per lane          |                |                                  |         | -30     | dBm   |       |   |
| Relative Intensity Noise                                  | RIN            |                                  |         | -130    | dB/hz |       |   |
| Transmitter Reflectance                                   |                |                                  |         | -12     | dB    |       |   |
| Optical Return Loss Tolerance                             |                |                                  |         | 20      | dB    |       |   |
| Transmitter eye mask definitions: X1, X2, X3, Y1, Y2, Y3  |                | 0.25, 0.4, 0.45, 0.25, 0.28, 0.4 |         |         |       |       | 2 |
| <b>Receiver</b>   |                |                                  |         |         |       |       |   |
| Signaling Speed per Lane                                  | BRAVE          |                                  | 25.78   |         | Gbps  |       |   |
| Data Rate Variation                                       |                | -100                             |         | +100    | ppm   |       |   |
| Damage threshold per lane                                 | Rxdmg          | 5.5                              |         |         | dBm   |       |   |
| Lane_0 Center Wavelength                                  | $\lambda_{C0}$ | 1294.53                          | 1295.56 | 1296.59 | nm    |       |   |
| Lane_1 Center Wavelength                                  | $\lambda_{C1}$ | 1299.02                          | 1300.05 | 1301.09 | nm    |       |   |
| Lane_2 Center Wavelength                                  | $\lambda_{C2}$ | 1303.54                          | 1304.58 | 1305.63 | nm    |       |   |
| Lane_3 Center Wavelength                                  | $\lambda_{C3}$ | 1308.09                          | 1309.14 | 1310.19 | nm    |       |   |
| Average Receive Power per Lane                            | Rxpow          | -10.6                            |         | 4.5     | dBm   | 3     |   |
| Receive Power (OMA) per Lane                              | RxOMA          |                                  |         | 4.5     | dBm   |       |   |
| Receive Sensitivity in OMA per Lane                       | Rxsens         |                                  |         | -8.6    | dBm   |       |   |
| Receiver 3 dB electrical upper cutoff frequency, per lane |                |                                  |         | 31      | GHz   |       |   |
| Stressed Receiver Sensitivity (OMA) per Lane              | RXSRS          |                                  |         | -6.8    | dBm   | 4     |   |

|   |      |     |      |     |     |   |
|---|------|-----|------|-----|-----|---|
| <b>Optical Return Loss</b>                              | ORL  |     |      | -26 | dB  |   |
| <b>LOS Assert</b>                                       | LOSA | -25 |      |     | dBm |   |
| <b>LOS De-Assert</b>                                    | LOSD |     |      | -12 | dBm |   |
| <b>LOS Hysteresis</b>                                   |      | 0.5 |      |     | dB  |   |
| <b>Conditions of stressed receiver sensitivity test</b> |      |     |      |     |     |   |
| <b>Vertical eye closure penalty</b>                     | VECP |     | 1.8  |     | dB  | 5 |
| <b>Stressed eye J2 Jitter</b>                           | J2   |     | 0.3  |     | UI  | 5 |
| <b>Stressed eye J9 Jitter</b>                           | J9   |     | 0.47 |     | UI  | 5 |

**Notes:**

1. Average launch power, each lane (min) is informative and not the principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant; however, a value above this does not ensure compliance.
2. Hit ratio  $5 \times 10^{-5}$ .
3. Average receive power, each lane (min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.
4. Measured with conformance test signal at TP3 for BER = 10<sup>-12</sup>.
5. Vertical eye closure penalty, stressed eye J2 Jitter, and stressed eye J9 Jitter are test conditions for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

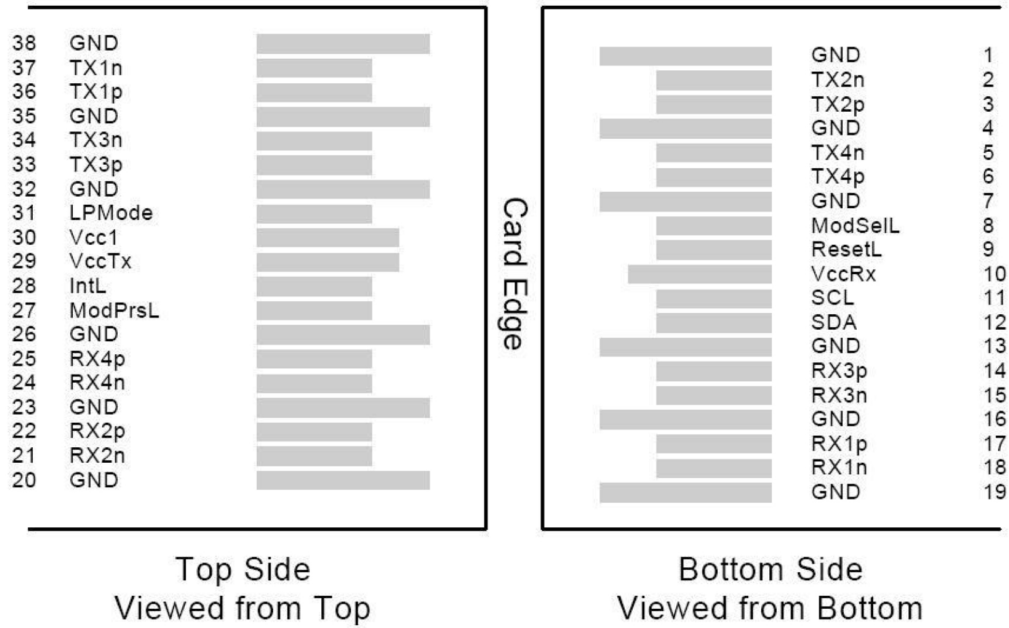
## Pin Descriptions

| Pin | Logic      | Symbol  | Name/Descriptions                                   | Ref. |
|-----|------------|---------|---|------|
| 1   |            | GND     | Module Ground                                       | 1    |
| 2   | CML-I      | Tx2-    | Transmitter inverted data input                     |      |
| 3   | CML-I      | Tx2+    | Transmitter non-inverted data input                 |      |
| 4   |            | GND     | Module Ground                                       | 1    |
| 5   | CML-I      | Tx4-    | Transmitter inverted data input                     |      |
| 6   | CML-I      | Tx4+    | Transmitter non-inverted data input                 |      |
| 7   |            | GND     | Module Ground                                       | 1    |
| 8   | LVTTTL-I   | MODSEIL | Module Select                                       | 2    |
| 9   | LVTTTL-I   | ResetL  | Module Reset  | 2    |
| 10  |            | VCCRx   | +3.3v Receiver Power Supply                         |      |
| 11  | LVCNOS-I   | SCL     | 2-wire Serial interface clock                       | 2    |
| 12  | LVCNOS-I/O | SDA     | 2-wire Serial interface data                        | 2    |
| 13  |            | GND     | Module Ground                                       | 1    |
| 14  | CML-O      | RX3+    | Receiver non-inverted data output                   |      |
| 15  | CML-O      | RX3-    | Receiver inverted data output                       |      |
| 16  |            | GND     | Module Ground                                       | 1    |
| 17  | CML-O      | RX1+    | Receiver non-inverted data output                   |      |
| 18  | CML-O      | RX1-    | Receiver inverted data output                       |      |
| 19  |            | GND     | Module Ground                                       | 1    |
| 20  |            | GND     | Module Ground                                       | 1    |
| 21  | CML-O      | RX2-    | Receiver inverted data output                       |      |
| 22  | CML-O      | RX2+    | Receiver non-inverted data output                   |      |
| 23  |            | GND     | Module Ground                                       | 1    |
| 24  | CML-O      | RX4-    | Receiver inverted data output                       |      |
| 25  | CML-O      | RX4+    | Receiver non-inverted data output                   |      |
| 26  |            | GND     | Module Ground                                       | 1    |
| 27  | LVTTTL-O   | ModPrsL | Module Present, internal pulled down to GND         |      |
| 28  | LVTTTL-O   | IntL    | Interrupt output, should be pulled up on host board | 2    |
| 29  |            | VCCTx   | +3.3v Transmitter Power Supply                      |      |
| 30  |            | VCC1    | +3.3v Power Supply                                  |      |
| 31  | LVTTTL-I   | LPMODE  | Low Power Mode                                      | 2    |
| 32  |            | GND     | Module Ground                                       | 1    |
| 33  | CML-I      | Tx3+    | Transmitter non-inverted data input                 |      |
| 34  | CML-I      | Tx3-    | Transmitter inverted data input                     |      |
| 35  |            | GND     | Module Ground                                       | 1    |
| 36  | CML-I      | Tx1+    | Transmitter non-inverted data input                 |      |
| 37  | CML-I      | Tx1-    | Transmitter inverted data input                     |      |
| 38  |            | GND     | Module Ground                                       | 1    |

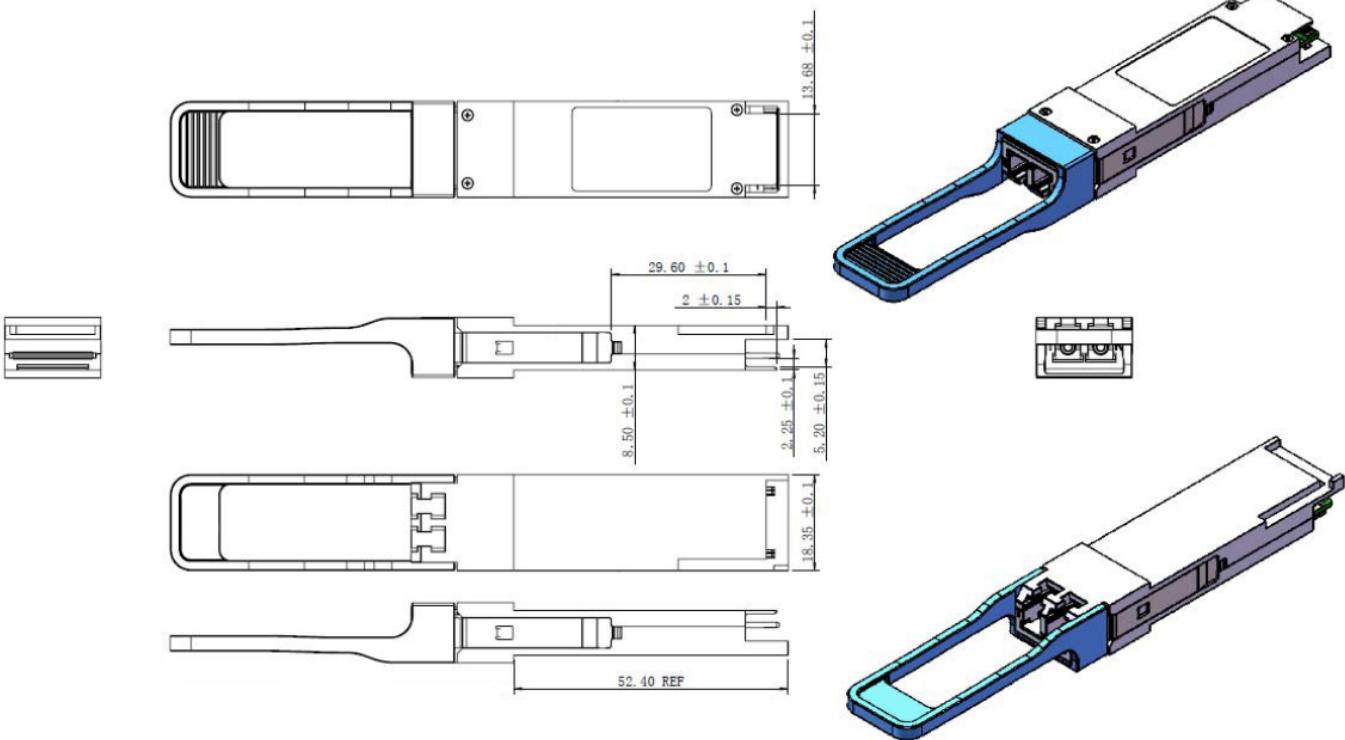
**Notes:**

1. Module circuit ground is isolated from module chassis ground with in the module.
2. Open collector; should be pulled up with 4.7k-10k ohms on host board to a voltage between 3.15V and 3.6V.

**Electrical Pin-out Details**



**Mechanical Specifications**



## **About AddOn Networks**

In 1999, AddOn Networks entered the market with a single product. Our founders fulfilled a severe shortage for compatible, cost-effective optical transceivers that compete at the same performance levels as leading OEM manufacturers. Adhering to the idea of redefining service and product quality not previously had in the fiber optic networking industry, AddOn invested resources in solution design, production, fulfillment, and global support.

Combining one of the most extensive and stringent testing processes in the industry, an exceptional free tech support center, and a consistent roll-out of innovative technologies, AddOn has continually set industry standards of quality and reliability throughout its history.

Reliability is the cornerstone of any optical fiber network and is engrained in AddOn's DNA. It has played a key role in nurturing the long-term relationships developed over the years with customers. AddOn remains committed to exceeding industry standards with certifications from ranging from NEBS Level 3 to ISO 9001:2005 with every new development while maintaining the signature reliability of its products.



## **U.S. Headquarters**

Email: [sales@addonnetworks.com](mailto:sales@addonnetworks.com)

Telephone: +1 877.292.1701

Fax: 949.266.9273

## **Europe Headquarters**

Email: [salesupportemea@addonnetworks.com](mailto:salesupportemea@addonnetworks.com)

Telephone: +44 1285 842070